

شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية



شرح الدرس الرابع logarithms Natural من الوحدة السادسة ريفيل

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تاريخ نشر الملف على موقع المناهج: 04:54:34 2023-10-07 | اسم المدرس: محمد زياد

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



روابط مواد الصف الحادي عشر المتقدم على تلغرام

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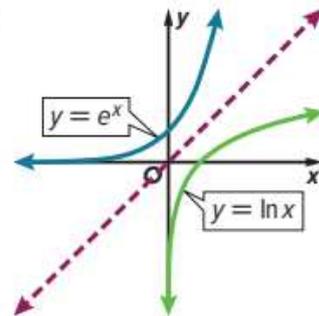
المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الأول

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An exponential function with base e , written as $y = e^x$, is called a **natural base exponential function**. Recall that e is an irrational number with an approximate value of 2.7182818...

The inverse of a natural base exponential function is a **natural logarithm**, which can be written as $\log_e x$, but is more often abbreviated as $\ln x$. Every point on the graph of $y = e^x$ is reflected in the line $y = x$, resulting in the graph of $y = \ln x$.



You can write equivalent exponential equations by using the definition of a natural logarithm.

$$\ln 6 = x \rightarrow \log_e 6 = x \rightarrow e^x = 6$$

Ex: Write the following:

a) $\ln(x + 1) = 5$ in exponential form

$$e^5 = x + 1$$

b) $e^{3x^2} = 10$ in Logarithmic form

$$\ln 10 = 3x^2$$

Ex: Write the following as a single logarithm

a) $2\ln 8 - \ln k + \ln 3$

$$= \ln 8^2 - \ln k + \ln 3$$

$$= \ln 64 - \ln k + \ln 3$$

$$= \ln\left(\frac{64}{k}\right) + \ln 3$$

$$= \ln\left(\frac{64}{k} \cdot 3\right) = \ln\left(\frac{192}{k}\right)$$

b) $\ln 4 + \ln k - 2\ln 3$

$$= \ln 4 + \ln k - \ln 3^2$$

$$= (\ln 4 + \ln k) - \ln 9$$

$$= \ln(4k) - \ln(9) = \ln\left(\frac{4k}{9}\right)$$

$$\frac{a \cdot 2}{b \cdot 1}$$

Ex: Solve each equation. Round to the nearest ten-thousandth

a) $\frac{2e^{x-5}}{2} = \frac{10}{2}$

$e^{x-5} = 5$

take ln to both sides

~~$\ln e^{x-5} = \ln 5$~~

$x-5 = \ln 5$

$x = \ln 5 + 5 = 6.6094$

~~$\ln e^x = \ln y \Rightarrow x = \ln y$~~

~~$\ln x = \frac{y}{e} \Rightarrow x = e^y$~~

~~$\ln x = \frac{a}{e} \Rightarrow e^x = a$~~

b) $\frac{3e^{2x+1} - 2}{+2} = \frac{10}{+2}$

~~$\frac{3e^{2x+1}}{3} = \frac{12}{3}$~~

~~$\ln e^{2x+1} = \ln 4$~~

$2x + 1 = \ln 4$

$\frac{2x}{2} = \frac{\ln(4) - 1}{2} \Rightarrow x = \frac{\ln 4 - 1}{2} = 0.1931$

c) ~~$\ln(2x - 6) = 4$~~

$2x - 6 = e^4$

$\frac{2x}{2} = \frac{e^4 + 6}{2} \Rightarrow x = \frac{e^4 + 6}{2} \approx 30.2991$

Check:

$\ln\left(2\left(\frac{e^4 + 6}{2}\right) - 6\right) \stackrel{?}{=} 4$

~~$\ln e^4 = 4$~~

$4 = 4$ ✓

$$d) \ln(2x) + \ln(5x) = 1$$

$$\ln(2x \cdot 5x) = 1$$

$$\ln(10x^2) = 1$$

$$\Rightarrow \frac{10x^2}{10} = \frac{e^1}{10} \Rightarrow \sqrt{x^2} = \sqrt{\frac{e}{10}} \Rightarrow x = \pm \sqrt{\frac{e}{10}} = \pm 0.5214$$

Check

$$x = -0.5214$$

$$x = 0.5214$$

$$\ln(2(-0.5214)) + \ln(5(-0.5214)) \stackrel{?}{=} 1$$

undefined

extraneous solution

$$\ln(2(0.5214)) + \ln(5(0.5214)) \stackrel{?}{=} 1$$

$$1 = 1 \quad \checkmark$$

Ex: USE A MODEL Monique wants to invest \$4000 in a savings account that pays 3.4% annual interest compounded continuously. The formula $A = Pe^{rt}$ is used to find the amount in the account, where A is the amount in the account after t years, P is the principal amount invested, and r is the annual interest rate.

a. What is the balance of Monique's account after 5 years?

$$P = 4000, \quad r = 3.4\% = 0.034, \quad t = 5$$

$$A = Pe^{rt}$$

$$A = 4000 \cdot e^{0.034(5)} = 4741.2194 \$$$

b. Suppose Monique wants to wait until there is at least \$6000 in her account before withdrawing any money. How long must she keep her money in the savings account?

$$A \geq 6000$$

$$\frac{4000 \cdot e^{0.034t}}{4000} \geq \frac{6000}{4000}$$

$$\ln e^{0.034t} \geq \ln 1.5$$

$$\frac{0.034t}{0.034} \geq \frac{\ln 1.5}{0.034} \Rightarrow t \geq 11.925 \text{ years}$$